Docket No.: Olive

UNITED STATES PATENT APPLICATION

# REFRIGERATOR WATER SUPPLY SYSTEMS

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"Express Mail" mailing number EV530238194US
Date of Deposit April 21, 2004
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# Description

# REFRIGERATOR WATER SUPPLY SYSTEMS

## Related Applications

This application claims the benefit of U.S. provisional patent application no. 60/466,152, filed April 28, 2003, the disclosure of which is incorporated herein by reference in its entirety.

## Technical Field

The present invention relates to refrigerators. More particularly, the present invention relates to refrigerator water supply systems situated for dispensing water to an automatic ice maker and/or a water dispenser.

## Background Art

Many currently available refrigerators include water dispensers and automatic ice makers. Typically, water is supplied to the water dispenser and ice maker via connection to a household water tap source such as a municipal water supply or a rural well system. In recent years, water filters have been incorporated into refrigerators for filtering the water supplied from the household water tap.

Although current refrigerators have water filters incorporated therein, the water filtered from the water tap can be unsuitable to many persons to consume. It has been widely reported that water supplied from the water tap can be unhealthy for consumption, especially in the long term. For example, the water supplied from municipal water supplies can typically contain chlorine and various other chemicals that make the water unsuitable for consumption. Furthermore, during drought conditions, municipalities often recycle used water to clean the filtration system. This "back-wash water" is then put back into the reservoir to be treated and used. The problem is that the backwash can contain microbes, such as *Giardia* and *Cryptosporidium*, which can cause sickness. Additionally, the water supplied from a rural well system can contain high amounts of certain unhealthful minerals, runoff chemicals from nearby farms, and other harmful contaminants, which cannot always be adequately filtered.

Recently, many persons have turned to consuming bottled water because it is more pure than the water available from a household water tap. Bottled water is typically stored in the refrigerator compartment of a refrigerator or on a household water cooler. In this way, the water can be conveniently used for drinking but not for making ice. Most conventional refrigerators include an automatic ice maker connected to the household water tap for supplying water to make ice. As opposed to consuming the ice made from the ice maker, many persons fill up ice cube trays with bottled water to produce ice in the freezer compartment of the refrigerator. It would be beneficial to provide

a refrigerator having a water supply system that can be conveniently connected with a water supply tank or bottled water source.

Some effort has been made to integrate the water from a bottled water container into the water dispenser or ice maker of a refrigerator. U.S. Patent No. 6,039,219 discloses one attempt to integrate a refrigerator liquid dispenser with a refillable liquid bottle. The refillable liquid bottle is attached to the inside of the refrigerator compartment door for chilling the stored liquid. The liquid bottle includes an output connected through the refrigerator compartment door to the exterior for operation by an operator to dispense liquid. The patent fails to disclose any type of integration with an automatic ice maker. It would be beneficial to provide a system for integrating a refillable liquid bottle with an ice maker.

U.S. Patent No. 3,570,266 discloses a refrigerator having an ice maker water reservoir. The water reservoir includes an inlet for connection to an automatic ice maker. Water can be obtained from a dispenser on the water reservoir. However, it would be beneficial to provide integration of a water supply tank to the water supply system of a refrigerator.

Despite progress in the art, exemplified by the forgoing patents, there exists a need in the art for a system for integrating a removable water supply tank with an automatic ice maker and a water dispenser of a refrigerator.

## Disclosure of the Invention

According to one aspect of the invention, a refrigerator is provided. The refrigerator can include a cabinet including at least one wall and a door pivotally mounted to the at least one wall to define a refrigeration compartment. The refrigerator can also include a first water supply line extending into the cabinet and adapted to interface with a removable water supply. Further, the refrigerator can include a mount attached to the cabinet and positioned to hold the removable water supply in the refrigeration compartment for interfacing the first water supply line.

According to a second aspect of the invention, a refrigerator is provided. The refrigerator can include a cabinet including at least one wall and a door pivotally mounted to the at least one wall to define a refrigeration compartment. The refrigerator can also include a first water supply line extending into the cabinet and adapted to interface with a removable water supply. Additionally, the refrigerator can include a water dispenser and ice maker connected to the first water supply line for receiving water from the removable water supply. The refrigerator can also include a mount attached to the cabinet and positioned to hold the removable water supply in the refrigeration compartment for interfacing the first water supply line.

According to a third aspect of the invention, a refrigerator is provided. The refrigerator can include a cabinet including at least one wall and a door pivotally mounted to the at least one wall to define a refrigeration compartment. The refrigerator can also include a water supply mounted in the refrigeration

compartment. Additionally, the refrigerator can include a first water supply line extending into the cabinet and connected to the water supply. The refrigerator can also include a water dispenser and ice maker connected to the first water supply line for receiving water from the removable water supply.

According to a fourth aspect of the invention, a removable water supply for insertion into a refrigerator cabinet having guides is provided. The removable water supply can include at least one wall forming an interior for holding water therein. The removable water supply can also include a cap adapted to interface the probe of a refrigerator for dispensing water from the interior to the refrigerator. Further, the removable water supply can include at least one contact surface connected to the at least one wall for positioning the removable water supply in the refrigerator by contacting the guides of the refrigerator.

Accordingly, it is an object of the present invention to improving the supply of water to the ice maker and water dispenser of a refrigerator.

It is another object of the present invention to provide a removable water supply for a refrigerator having connection to the ice maker and water dispenser.

Some of the objects of the invention having been stated hereinabove, other objects will become evident as the description proceeds when taken in connection with the accompanying drawings as best described hereinbelow.

## Brief Description of the Drawings

Exemplary embodiments of the invention will now be explained with reference to the accompanying drawings, of which:

Figure 1 is a perspective view of a refrigerator incorporating a water supply tank according to an embodiment of the present invention;

Figure 2 is another perspective view of the refrigerator illustrated in Figure 1 with the water supply removed;

Figure 3 is another perspective view of the refrigerator illustrated in Figure 1 with the water supply tank removed and a removable shelf positioned on the supports of water supply tank;

Figure 4 is a perspective view of another embodiment of a refrigerator with a plurality of removable water supply tanks according to another embodiment of the present invention;

Figure 5 is a side, cross-sectional view of the refrigeration compartment of the refrigerator illustrated in Figure 1;

Figure 6 is a side, cross-sectional view of the freezer compartment of the refrigerator illustrated in Figure 1 including an ice and an ice/water dispenser;

Figure 7 is a cross-sectional view of the water supply tank of the refrigerator illustrated in Figure 1;

Figures 8A and 8B are cross-section views of a water supply tank according to an embodiment of the present invention;

Figure 9 is a water/ice dispensing system operable with water supply tank according to an embodiment of the present invention;

Figures 10A and 10B are schematic diagrams of control circuits for the water/ice dispensing system illustrated in Figure 9 according to an embodiment of the present invention;

Figure 11 is a water/ice dispensing system operable with a water supply tank according to another embodiment of the present invention; and

Figure 12 is a schematic diagram of a control circuit for water/ice dispensing system illustrated in Figure 11 according to one embodiment of the present invention.

## Detailed Description of the Invention

The present invention now is described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

Referring to Figure 1, a perspective view of a refrigerator, generally designated **100**, incorporating a removable water supply tank **102** according to an embodiment the present invention is illustrated. Refrigerator **100** can include a cabinet **104** having a plurality of insulated walls. A freezer door **106** and a refrigerator door **108** are pivotally mounted to cabinet **104** and cooperate with cabinet **104** to define a freezer compartment (shown in Figure 6 and described in more detail below) and a refrigeration compartment **110**,

respectively. The illustrated refrigerator **100** is commonly known in the art as a "side-by-side" type refrigerator because the freezer and refrigeration compartments are positioned side-by-side one another.

It is contemplated that removable water supply tank **102** and the systems described hereinbelow can be used in other types of refrigerators, such as ones wherein the freezer and refrigeration compartments are vertically offset relative to one another. Furthermore, although the following discussion is based upon incorporation of a removable water supply tank into refrigerator **100**, which includes an automatic ice maker (shown in Figure 6) and a water dispenser **112**, it is considered apparent that water supply tank **102** can be used in refrigerators that do not include an automatic ice maker, and in refrigerators wherein the ice and/or water dispenser is not accessible from an exterior of the refrigerator.

As shown in Figure 1, refrigeration compartment **110** is generally rectangular in configuration, and has a series of shelves **114** mounted therein for storage of foodstuffs. At an upper portion of refrigeration compartment **110**, a panel **116** is provided to which various controls and indicators **118** for controlling and/or monitoring water supply tank **102** and/or regulating operating conditions of refrigerator **100** can be mounted. Specifically, panel **116** can include a water supply switch **120** for controlling whether water supplied to the ice maker and water dispenser **112** is made available from water supply tank **102** or the water tap, such as a well or municipal water supply. In an alternative embodiment, freezer door **106** can include an indicator for indicating a low

water supply condition in water supply tank **102**. Refrigerator **100** can also include a filter **122** for filtering the water supplied from the water tap.

Referring to Figure 2, another perspective view of refrigerator **100** with water supply tank **102** (shown in Figure 1) removed according to an embodiment of the present invention is illustrated. Refrigerator **100** includes a probe **200** connected to a back wall portion **202** of refrigeration compartment **110** for interfacing a corresponding cap (shown in Figures 5, 7, 8A, and 8B and described in more detail below) of water supply tank **102**. As described in further detail below, probe **200** and the cap of water supply tank **102** can interface one another for the delivery of water from water supply tank **102** to the water supply system of refrigerator **100**. The delivered water can then be selectively distributed to water dispenser **112** and the automatic ice maker.

Refrigerator **100** can also include a plurality of supports **204** attached to the walls of refrigeration compartment **110** for holding water supply tank **102** in refrigerator compartment **110**. Supports **204** can also receive and position the cap of water supply tank **102** to interface probe **200** when water supply tank **102** is properly inserted into refrigeration compartment **110** (described in more detail below). Referring now to Figure 3, another perspective view of refrigerator **100** with water supply tank **102** (shown in Figure 1) removed and a removable shelf **300** positioned on supports **204** according to the present invention is illustrated. Supports **204** can hold shelf **300** for providing additional storage space for foodstuffs when water supply tank **102** is not utilized.

Figure 4 illustrates a perspective view of a refrigerator **400** with a plurality of removable water supply tanks **402** according to another embodiment of the present invention. The utilization of a plurality of water supply tanks **402** facilitates the loading of a large amount of water into refrigerator **400** because the tanks are easier for a person to separately lift into position than lifting a single large water supply tank containing an equivalent amount of water. Refrigerator **400** can also include a plurality of probes (not shown) for interfacing the caps of water supply tanks **402**. Refrigerator **400** can include controls **404** for selectively switching the sourcing of water between water supply tanks **402** to the water supply line. The selective switching between water supply tanks **402** can be useful when different types of water or other consumable liquids are stored in the water supply tanks.

Figure 5 illustrates a side, cross-sectional view of refrigeration compartment **110** of refrigerator **100**. Water supply tank **102** is shown positioned with a cap, generally designated **500**, inserted into probe **200** for dispensing water to a first control valve **502** (as described in further detail below). Water supply tank **102** can include a handle **504** for contact by an operator to push water supply tank **102** in a general direction **x 506** into the shown position. During insertion, water supply tank **102** can partially rest upon and slide against supports **204**. Further, when water supply tank **102** is being inserted and nears the position as shown, guides **508** and **510** contact guide contact surfaces **512** and **514** of water supply tank **102**, respectively, to guide water supply tank **102** in position with cap **500** into probe **200**.

When in the proper position shown in Figure 5, cap **500** is positioned at the bottom of water supply tank **102** for draining all of the water in water supply tank **102** out through a first water supply line **516** to first control valve **502**. As described in more detail below, first control valve **502** can control the flow of water to other water control components, generally designated **518**, for controlling the flow of water to ice/water dispenser **112** and the ice maker. Water control components **518** are described in more detail below. Water can flow to the other water control components from first control valve **502** via a second water supply line **520**. Refrigerator **100** can also include a third water supply line **522** for delivery of water from the water tap to water control components **518**. Water control components **518** can control delivery of water from the water tap and water supply tank **102** to the ice maker and ice/water dispenser **112**. The operation of first control valve **502** and water control components **518** are described in more detail below.

Figure 6 illustrates a side, cross-sectional view of a freezer compartment **600** of refrigerator **100** including an ice maker **910** (also shown in Figure 9 and described in further detail below) and ice/water dispenser **112**. Ice maker **910** can include an ice container **602** for storing ice and a dispenser **604** for delivery of ice from ice container **602** to ice/water dispenser **112**. After receiving ice from ice container **602**, ice/water dispenser **112** can dispense water on the exterior of refrigerator **100**. Water can be delivered to ice maker **910** from water control components **518** via a fourth water supply line **606**. Water can be delivered to ice/water dispenser **112** from water control components **518** via a

fifth water supply line **608**. Fifth water supply line **608** extends from water control components **518** around the bottom of refrigerator **100** and up the bottom of freezer door **106**.

Figure 7 illustrates a cross-sectional view of water supply tank **102**. Handle **504** can be used to pull water supply tank **102** in a direction generally opposing direction **x 506** (shown in Figure 5) for removing water supply tank **102** from refrigeration compartment **110**. Water supply tank **102** can also include a removable cap **700** covering an opening **702** for filling water supply tank **102** with water.

Referring to Figure 8A, a cross-sectional view of cap **500** of water supply tank **102** and probe **200**. Cap **500** can include a pull tab **800**, scoreline **802**, snap-on ring section **804** for removal of cap **500** for refill by a water bottler, as known to those of skill in the art. Snap-on ring section **804** can include a lower lip **806** which extends around the lower circumference of snap-on ring section **804**. Cap **500** can include include at least two different outside diameters, i.e., at least one diameter at snap-on ring section **804** and at least one diameter below lip **806** of snap-on ring section **804**. Cap **500** can also include a relatively planar upper face **808**. Formed integrally with this upper face **808** is a central dispensing tube **810**. Central dispensing tube **810** has an outlet **812** through which the water may be dispensed. For the purpose of sealing cap **500** and, more specifically, central dispensing tube **810** to prevent water from being discharged before installation, a dispensing tube cap **814** can be attached to the innermost end of sealingly engaging probe **200**. When

inserted, probe **200** passes through outlet **812** of central dispensing tube **810**, and a groove on the probe extends to the dispensing tube cap **814**. When probe **200** is far enough inside the water supply tank **102**, a hole in the side of probe **200** allows water to flow freely from water supply tank **102**.

Referring to Figure 8B, a cross-sectional view of a cap, generally designated **816**, of a water supply tank **818** of another embodiment of the present invention. Cap **816** is shown connected to an insertion nozzle **820** of the refrigerator. Cap **816** can include a valve **822**, as known to those of skill in the art, for release of water inside water supply tank **818** by an operator after the water supply tank **818** has been positioned in the refrigerator. After release, water can flow into the water dispensing system of the refrigerator for use by an ice maker and ice/water dispenser.

Alternatively, water supply tank **102** can be permanently attached to first water supply line **516**. In this alternative, water can be refilled by access through cap **700** by an operator.

Water supply tank **102** described above is intended for use as part of a water/ice dispensing system. Figure 9 illustrates a water/ice dispensing system, generally designated **900**, operable with water supply tank **102** according to an embodiment of the present invention. Dispensing system **900** includes, in addition to the above-described water supply tank **102**, first control valve **502**, a second control valve **902**, a third control valve **904**, a fourth control valve **906**, a water storage tank **908**, an automatic ice maker **910**, a filter **912**, and combination ice/water dispenser **112**.

First control valve **502** can be relatively upstream, in a direction of water flow, from third control valve **904**, and controls the delivery of water from water supply tank **102** to third control valve **904**. As described in more detail below, third control valve **904** can control water flow to ice maker **910** and ice/water dispenser **112**. First control valve **502** has an input **914** and output **916** which is opened and closed by a solenoid **916a** (shown in Figures 10A and 10B and described in more detail below).

First control valve input **914** can be connected to water supply tank **102** via first water supply line **516**. In an alternative embodiment, first water supply line **516** can include a water sensor for detecting the supply of water from water supply tank **102**. A low water supply condition can be indicated on the freezer door by the above-mentioned indicator. Output **916** can be connected to third control valve **904** via second water supply line **520**.

Second control valve **902** can be connected to the water tap by third water supply line **522**. Third water supply line **522** is connected to an input **918** of second control valve **902**. Second control valve **902** has an output **920** for delivery of water from the water tap to filter **912** via a sixth water supply line **922**. Output **920** is opened and closed by a solenoid **920a** (shown in Figures 10A and 10B).

Filter **912** is connected to fourth control valve **906** via a seventh water supply line **924**. Sixth water supply line **924** is connected to an input **926** of fourth control valve **906**. Fourth control valve **906** has an output **928** for delivery of water from filter **912** to third control valve **904** via an eighth water

supply line **930**. Output **928** is opened and closed by a solenoid **928a** (shown in Figures 10A and 10B). Fourth control valve **906** can be closed when first control valve **502** is opened to deliver water to prevent water from flowing through fourth control valve **906** to filter **912**. Conversely, when water is delivered through fourth control valve **906** from the water tap, first control valve **502** can be closed to prevent water from flowing through first water control valve to water supply tank **102**.

Second water supply line **520** and eighth water supply line **930** are connected together to interface an input **932** of third control valve **904**. Third control valve **904** can control the flow of water from water supply tank **102** or the water tap to ice/water dispenser **112** and ice maker **910** via first output **934** and second output **936**, respectively. Outputs **934** and **936** are opened and closed by solenoids **934a** and **936a**, respectively (shown in Figures 10A and 10B and described in more detail below). First output **934** is fluidly connected to water storage tank **908** via a ninth water supply line **938**. Second output **936** is connected to ice maker **910** via fourth supply line **606**. In one embodiment, second output **936** of third control valve **904** includes a "flow washer" to regulate the flow of water into ice maker **910** to provide a controlled filling thereof.

An output of water storage tank **908** is connected to ice/water dispenser **112** by fourth water supply line **606**. Ice maker **910** delivers ice to ice/water dispenser **112** via a chute **940**. Ice/water dispenser **112** includes a water dispenser switch **112a** (shown in Figure 10B and described in more detail

below). Ice maker **910** includes a switch **910a** (shown in Figure 10B and described in more detail below).

As known to those of skill in the art, water/ice dispensing system **900** can include water pumps operable to apply water pressure for causing water to flow as described above.

Referring to Figures 10A and 10B, schematic diagrams of control circuits for refrigerator **100** according to an embodiment of the present invention is illustrated. When water supply control **120** is actuated to dispense water from water supply tank **102**, water supply switch **120a** is switched to a contact **1000** to provide power to first control valve's solenoid **916a** to open first control valve's output **916**. Opening output **916** permits the flow of water from water supply tank **102** to third control valve **522**, which may be controlled to permit the water to flow to either ice maker **910** or water dispenser **112**.

On the other hand, when water supply control **120** is actuated to dispense water from the water tap, water supply switch **120a** is switched to a contact **1002** to provide power to second control valve's solenoid **920a** and fourth control valve's solenoid **928a** to open the second control valve's output **920** and fourth control valve's output **928**, respectively. Opening outputs **920** and **928** permits the flow of tap water via third water supply line **522** through filter **912** and to third control valve **904**. Third control valve **904** may be controlled to permit the water to flow to either ice maker **910** or ice/water dispenser **112**.

Referring now to Figure 10B, once water from either the water tap or water supply tank **102** is available at input **932** of third control valve **904**, ice/water dispenser **112** can be actuated to dispense water and automatic ice maker **910** can request water to make more ice. When ice/water dispenser **112** is actuated to dispense water, a water dispenser switch **112a** is closed which, in turn, provides power to third control valve's first solenoid **934a** to open the control valve's first output **934**. Opening first output **934** permits the flow of water to cold water storage tank **908** and out of ice/water dispenser **112**.

Similarly, when automatic ice maker **910** needs water to make more ice, ice maker switch **910a** is closed which, in turn, provides power to the third control valve's second solenoid **936** to open the control valve's second output **936**. Opening second output **936** permits the flow of water to ice maker **910**.

Referring to Figure 11, a water/ice dispensing system, generally designated **1100**, operable with a water supply tank **1102** according to another embodiment of the present invention is illustrated. Dispensing system **1100** can include a first water storage tank **1104**, a first control valve **1106**, a second control valve **1108**, a filter **1110**, a third control valve **1112**, an ice maker **1114**, a second water storage tank **1116**, and an ice/water dispenser **1118**. First water storage tank **1104** can receive water from water supply tank **1102** for storing water in the refrigerator in addition to the water in water supply tank **1102**. Thus, because of the additional storage, the time between refill of water supply tank **1102** can be increased. Water supply tank **1102** is connected to first water storage tank **1104** via a first water supply line **1120**. In an alternative

embodiment, first water storage tank **1104** can include a low water detector for detecting a low water condition and reporting the condition to an indicator. The indicator can alert an operator to a low water condition.

Water from first water storage tank **1104** flows to an input **1122** of first control valve **1106** through a second water supply line **1124**. First control valve **1106** can control the flow of water from water supply tank **1102** to ice maker **1114** and ice/water dispenser **1118** via outputs **1126** and **1128**, respectively. Outputs **1126** and **1128** are opened and closed by solenoids **1126a** and **1128a**, respectively (shown in Figure 12 and described in more detail below). First output **1126** is fluidly connected to ice maker **1114** via a third water supply line **1130**. Second output **1128** is connected to ice/water dispenser **1118** via a fourth water supply line **1132**.

Water from a water tap flows to an input **1134** of second control valve **1108** through a fifth water supply line **1136**. Second control valve **1108** can control the flow of water from water tap supply to filter **1110** through an output **1138** via fifth water supply line **1140**. Water can flow through filter **1110** and a sixth water supply line **1142** to an input **1144** of third control valve **1112**. Third control valve **1112** can control the flow of water from water tap to ice maker **1114** and ice/water dispenser **1118** via outputs **1146** and **1148**, respectively. Outputs **1146** and **1148** are opened and closed by solenoids **1146a** and **1148a**, respectively (shown in Figure 12 and described in more detail below). First output **1146** is fluidly connected to third water supply line **1130** via a seventh water supply line **1150** for connection to ice maker **1114**. Second output **1148**

is connected to fourth water supply line **1132** via an eighth water supply line **1152** for connection to ice/water dispenser **1118**. Second water storage tank **1116** can be connected to ice/water dispenser **1118** via a ninth water supply line **1154**. Ice maker **1114** delivers ice to ice/water dispenser **1118** via a chute **1156**.

Referring to Figure 12, a schematic diagram of a control circuit for water/ice dispensing system **1100** according to one embodiment of the present invention is illustrated. When a water supply control on a refrigerator is actuated to dispense water from water supply tank **1102** and ice maker **1114** indicates that water is required, water supply switch **1200** is switched to a first contact **1202** and ice maker switch **1114a** is switched to a second contact **1204**, then power is provided to first control valve's solenoid **1126a**. Opening output **1126** permits the flow of water from water supply tank **1102** to ice maker **1114**. A logic AND gate **1206** is used to symbolize the condition for opening output **1126**.

On the other hand, when the water supply control on the refrigerator is actuated to dispense water from water supply tank **1102** and water dispenser **1118** is actuated to dispense water, water supply switch **1200** is switched to first contact **1202** and water dispenser switch **1118a** is switched to a third contact **1208**, then power is provided to first control valve's solenoid **1128a**. Opening output **1128** permits the flow of water from water supply tank **1102** to water dispenser **1118**. A logic AND gate **1210** is used to symbolize the condition for opening output **1128**.

When the water supply control on the refrigerator is actuated to dispense water from the water tap and ice maker **1114** indicates that water is required, water supply switch **1200** is switched to a fourth contact **1212** and ice maker switch **1114a** is switched to second contact **1204**, then power is provided to second control valve's solenoid **1138a** and provided to third control valve's solenoid **1146a**. Opening outputs **1138** and **1146** permits the flow of water from the water tap to ice maker **1114**. A logic AND gate **1214** is used to symbolize the condition for opening outputs **1138** and **1146**.

On the other hand, when the water supply control on the refrigerator is actuated to dispense water from the water tap and water dispenser **1118** is actuated to dispense water, water supply switch **1200** is switched to fourth contact **1212** and water dispenser switch **1118a** is switched to third contact **1208**, then power is provided to first control valve's solenoid **1128a** and provided to third control valve's solenoid **1148a**. Opening outputs **1128** and **1148** permits the flow of water from the water tap to water dispenser **1118**. A logic AND gate **1216** is used to symbolize the condition for opening outputs **1138** and **1148**.

It will be understood that various details of the invention may be changed without departing from the scope of the invention. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation--the invention being defined by the claims.